

REMARKS

Claims 1-19 are all the claims presently pending in the application. Claims 1-6 have been amended to more particularly define the invention. Claims 7-19 have been added to claim additional features of the invention.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicants specifically state that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Applicants gratefully acknowledge the Examiner's indication that claims 3 and 4 would be allowable if rewritten in independent form. However, Applicants respectfully submit that all of claims 1-19 are allowable.

Claims 1 and 5 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Etsuro (JP 2001108025). Claim 2 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Etsuro. Claims 1 and 5-6 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Murakami et al. (U.S. Patent Publication No. 2001/0040067; hereinafter "Murakami") in view of Eda (U.S. Patent Publication No. 2004/0245040).

These rejections are respectfully traversed in the following discussion.

I. THE CLAIMED INVENTION

The claimed invention (e.g., as defined by exemplary claim 1) is directed to a motor-driven power steering apparatus. The steering apparatus includes a drive gear connected to an output shaft of a motor, a follower gear meshed with the drive gear, which is connected to a steering unit, a bearing for supporting one end of the drive gear, a support portion in which the bearing is disposed, and a curved leaf spring having a length larger than a peripheral length of the bearing and fitted between the bearing and the support portion in a resiliently deformed state. The curved leaf spring is fitted along an outer peripheral surface of the bearing and an inner surface of the support portion, wherein the curved leaf spring urges the bearing so that a distance between an axis of the follower gear and an axis of the drive gear decreases.

Conventional motor-driven power steering devices provide a rubber ring mounted on an outer peripheral surface of the motor-remote-side shaft portion of the worm, to reduce backlash in meshed portions of the worm and worm wheel. However, due to the load and rotational torque applied to the rubber ring in the radial direction, the rubber ring is subject to deterioration. Furthermore, the degree of freedom for setting a preload for the urging force is relatively low since the elastic restoring force of the rubber ring itself urges the worm.

The claimed invention of exemplary claim 1, on the other hand, provides a curved leaf spring fitted along an outer peripheral surface of the bearing and an inner surface of the support portion (e.g., see Application at page 16, line 5 and Figure 4). This feature is important for eliminating a gap between the bearing and the curved leaf spring as well as between the curved leaf spring and the support member, which limits the movement of the worm (see Application at page 16, lines 5-11).

II. THE PRIOR ART REFERENCES

A. The Etsuro Reference

The Examiner alleges that Etsuro teaches the claimed invention of claims 1 and 5. Furthermore, the Examiner alleges that the claimed invention of claim 2 would have been obvious in view of Etsuro. Applicants respectfully submit, however, that Etsuro does not teach or suggest each and every feature of the claimed invention.

That is, Etsuro does not teach or suggest "*a curved leaf spring comprising a length larger than a peripheral length of the bearing and fitted between the bearing and the support portion in a resiliently deformed state, said curved leaf spring being fitted along an outer peripheral surface of the bearing and an inner surface of the support portion*" as recited in claim 1.

The Examiner attempts to rely on Figure 5 of Etsuro to support his allegation. The Examiner, however, is clearly incorrect.

That is, nowhere in this Figure (nor anywhere else for that matter) does Etsuro teach or suggest a curved leaf spring fitted along an outer peripheral surface of the bearing and an inner surface of the support portion. Indeed, the leaf spring (31) of Etsuro is clearly not fitted along the outer peripheral surface of the bearing and the inner surface of the support portion.

Etsuro merely teaches an electric steering device provided with a worm (71) and a worm wheel (72) engaged with the worm (71). The worm (71) can be displaced in the direction of the worm wheel (72) and in the axial direction of the worm wheel (72). The worm (71) is provided with a leaf spring (31) and a coil spring, which eliminate backlash in the worm (see Etsuro at Abstract).

As shown in Figure 5 of Etsuro, the leaf spring (31) is not fitted along the outer periphery of the bearing (17). Indeed, the leaf spring (31) merely contacts the bearing (17) at two discrete points. Additionally, only portions of the leaf spring (31) are fitted along the inner surface of the support portion (81). This results in large gaps between the curved leaf spring (31) and the bearing (17) and the support member (81) (see Etsuro at Figure 5).

In contrast, the claimed invention of exemplary claim 1 (e.g., as depicted in Figure 4) provides a curved leaf spring (12) that may be curved along the outer peripheral surface of the rolling bearing (8) and the inner side (74b) of the support portion (74). This allows a gap between the curved leaf spring (12) and the inner side (74b) of the support portion (74), and a gap between the curved leaf spring (12) and the rolling bearing (8) to be eliminated. Thus, the movement of the worm (3) in a direction intersecting the directions of the rotation-axis distance (H) is limited (see Application at page 16, lines 5-11).

Furthermore, as compared with conventional devices, the structure around the worm gear (3) may be made compact. Therefore, the overall size of the motor-driven power steering apparatus may be reduced (see Application at page 15, lines 17-21). This feature is not taught or suggested by Etsuro. Therefore, the advantages provided by the claimed invention of exemplary claim 1 are not realized by Etsuro.

Therefore, Applicants respectfully submit that Etsuro does not teach or suggest each and every feature of the claimed invention. Therefore, the Examiner is respectfully requested to reconsider and withdraw this rejection.

B. The Murakami Reference

Applicants respectfully submit that Murakami does not teach or suggest "*a curved leaf*

spring comprising a length larger than a peripheral length of the bearing and fitted between the bearing and the support portion in a resiliently deformed state, said curved leaf spring being fitted along an outer peripheral surface of the bearing and an inner surface of the support portion" as recited in claim 1.

Murakami merely teaches a bearing (10) mounted on a support (81) by an elastic member (20) (see Murakami at Figure 5). Murakami, however, does not even mention a curved leaf spring, let alone teach or suggest a curved leaf spring being fitted along an outer peripheral surface of the bearing and an inner surface of the support portion. Indeed, the Examiner does not even allege that Murakami teaches or suggest this feature.

C. The Eda Reference

The Examiner alleges that Murakami would have been combined with Eda to teach the claimed invention of claims 1, 5 and 6. Applicants respectfully submit, however, that these references would not have been combined as alleged by the Examiner and that, even if combined, the alleged combination would not teach or suggest each and every feature of the claimed invention.

Indeed, Applicants submit that Murakami is directed to a supporting structure of a bearing, in which a bearing tends to be movable in a direction in which the bearing approaches a driven gear (72), that is, the flexible characteristic of an elastic member has directivity. This directivity characteristic is an important feature of Murakami.

In contrast, the spiral spring (119) of Eda has no directivity and if the spiral spring is combined with the supporting structure of Murakami, the modified structure loses the directivity characteristic.

M.P.E.P. § 2143.01 states: "*If the proposed modification or combination of the prior art would change the principal of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious*" (emphasis added by Applicants). Additionally, M.P.E.P. § 2143.01 states: "*If the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification*" (emphasis added by Applicants).

Therefore, as indicated above, since the spiral spring of Eda would not provide the require directivity of Murakami, a person of ordinary skill in the art would not have been motivated to modify the device of Murakami as alleged by the Examiner.

Moreover, the Examiner's motivation to modify Murakami ("to provide an inexpensive and simple to manufacture alternative spring") is not a problem in Murakami that would require a solution.

Furthermore, nowhere does Eda provide support for the Examiners' alleged motivation. That is, nowhere does Eda teach or suggest that the spiral spring of Eda is an inexpensive alternative to the elastic member provided in Murakami.

Thus, as pointed out in MPEP 2143.01, the Examiner's motivation is "improper". That is, "the mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination" (emphasis in MPEP itself).

Moreover, Applicants respectfully submit that neither Murakami nor Eda, nor any combination thereof, teaches or suggests "*a curved leaf spring comprising a length larger than a peripheral length of the bearing and fitted between the bearing and the support portion in a resiliently deformed state, said curved leaf spring being fitted along an outer peripheral surface of the bearing and an inner surface of the support portion*" as recited in claim 1.

The Examiner attempts to rely on Figures 18A and 18B of Eda to support his allegation. The Examiner, however, is clearly incorrect. That is, nowhere in these figures (nor anywhere else for that matter) does Eda teach or suggest a curved leaf spring fitted along an outer peripheral surface of the bearing and an inner surface of the support portion. Eda does not even teach or suggest a curved leaf spring. Indeed, Eda merely teaches a spiral spring (119) disposed between the biasing member (112) and the bearing ring (114) (see Figure 18B and paragraph [0140] of Eda).

As shown in Figure 18B of Eda, a spiral spring (119) is disposed around a biasing member (112). The spring (119) is only fitted around a portion of the biasing member (112). The spring (119) is also only fitted around a portion of the inner surface the bearing ring (114).

Thus, gaps are formed between the biasing member (112) and the spring (119), as well as between the spring (119) and the bearing ring (114). Additional gaps are formed between each concentric layer of the spiral spring (119) (see Eda at Figure 18B). Eda does not teach or suggest this feature.

In contrast, the claimed invention of exemplary claim 1 allows a gap between the curved leaf spring (12) and the inner side (74b) of the support portion (74), and a gap between the curved leaf spring (12) and the rolling bearing (8) to be eliminated. Thus, the movement of the worm (3) in a direction intersecting the directions of the rotation-axis distance (H) is limited (see Application at page 16, lines 5-11) and the overall size of the worm gear may be made compact (see Application at page 15, lines 17-21).

Thus, Eda fails to make-up for the deficiencies of Murakami.

Therefore, Applicants respectfully submit that these references would not have been combined as alleged by the Examiner and that even if combined, the alleged combination would not teach or suggest each and every feature of the claimed invention. Therefore, the Examiner is respectfully requested to reconsider and withdraw this rejection.

III. NEW CLAIMS

New claims 7-19 have been added to provide more varied protection for the claimed invention and to claim additional features of the invention. These claims are independently patentable because of the novel features recited therein.

Applicants respectfully submit that new claims 7-19 are patentable over any combination of the applied references at least for analogous reasons to those set forth above with respect to claims 1-6.

IV. FORMAL MATTERS AND CONCLUSION

In response to Examiner's objections, the claims have been amended in a manner believed fully responsive to all points raised by the Examiner. Specifically, the term "type" has been removed from line 1 of claim 1.

In view of the foregoing, Applicant submits that claims 1-19, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition

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for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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FOR:  Reg. No. 46,672
Scott M. Tulino, Esq.
Registration No. 48,317

Sean M. McGinn, Esq.
Registration No. 34,386

McGinn & Gibb, PLLC
Intellectual Property Law
8321 Old Courthouse Road, Suite 200
Vienna, VA 22182-3817
(703) 761-4100
Customer No. 21254